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# *Interactive comment on* "Assessment of potential implications of agricultural irrigation policy on surface water scarcity in Brazil" *by* Sebastian Multsch et al.

**Anonymous Referee #1**

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The discussion paper presents an assessment of the impacts on blue water resources of expanding the irrigated areas in Brasil in view of the implementation of a recently introduced policy. The assessment is based on the value of a Water Scarcity Index that is defined as the ratio of water withdrawals and water availability. The Water Scarcity Index was calculated for 166,842 catchments, covering the whole country. The irrigation water withdrawals were estimated by using a simulation model based on the FAO 56 approach to estimate crop water requirements for the areas that are currently irrigated and for all the additional areas that potentially can be irrigated. The actual water withdrawals in each catchment are assumed to be twice the estimated crop water requirements. Water availability is expressed by the Q95 flow value. Historical time-



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series (1980–2013) of meteorological data were used in the simulations, while it is not specified whether Q95 values were computed over the same time period. The analysis presented in the paper is interesting, but the discussion of the assumptions that are made in the study and of how they may impact on the results obtained is insufficient. This is very important also in view of the fact that the authors stress the importance that their study may have in supporting informed decision making. A list of questions and observations is listed in the following and can be found in the comments to the paper in the attached file.

The study area is very large and covers a variety of hydrological conditions. It can be expected that the shape of Flow Duration Curves will be quite variable among the different catchments and hence Q95 will represent very different fractions of the total water availability depending on the location. Reasons for using (only) Q95 as a water availability index must be discussed.

Q95 values that were used in the study refer to natural flows or to flows that are possibly modified by diversions occurring upstream? Which time period is covered by the timeseries used to estimate Q95 values? Timeseries were available for all the 166,842 catchments?

Length of the growing periods and Kc values of a given crop may vary in space and in time, mainly according to meteorological conditions. In the study constant values of these parameters were assumed. Given the extension of the area and the variety of conditions, I wonder if any attempt to assess the impact of this assumption on the estimated crop water requirements has been made.

Conveyance and distribution losses are assumed to account for 50% of irrigation water withdrawals. Part of this losses will be recirculated within the river systems, mostly through the groundwater, from upstream areas to downstream ones, with losses in upstream areas that might contribute to discharge in downstream river stretches. This is not considered at all in the paper and it might produce an overestimation of the

impacts of irrigation water diversions, particularly in those catchments where the rivers gain flow from groundwater. This issue needs to be discussed.

I am not at ease with the way in which the term Water Scarcity is used in the paper: it sounds awkward to me to read that Water Scarcity is Excellent, even more so because this happens when the withdrawals are small compared to river flows, i.e. when water availability is excellent. I would prefer using Use-to-Resource ratio (as in Raskin et al. 1997, that the authors mention), or something similar, rather than Water Scarcity here.

Please also note the supplement to this comment:
https://www.hydrol-earth-syst-sci-discuss.net/hess-2019-174/hess-2019-174-RC1-supplement.pdf

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